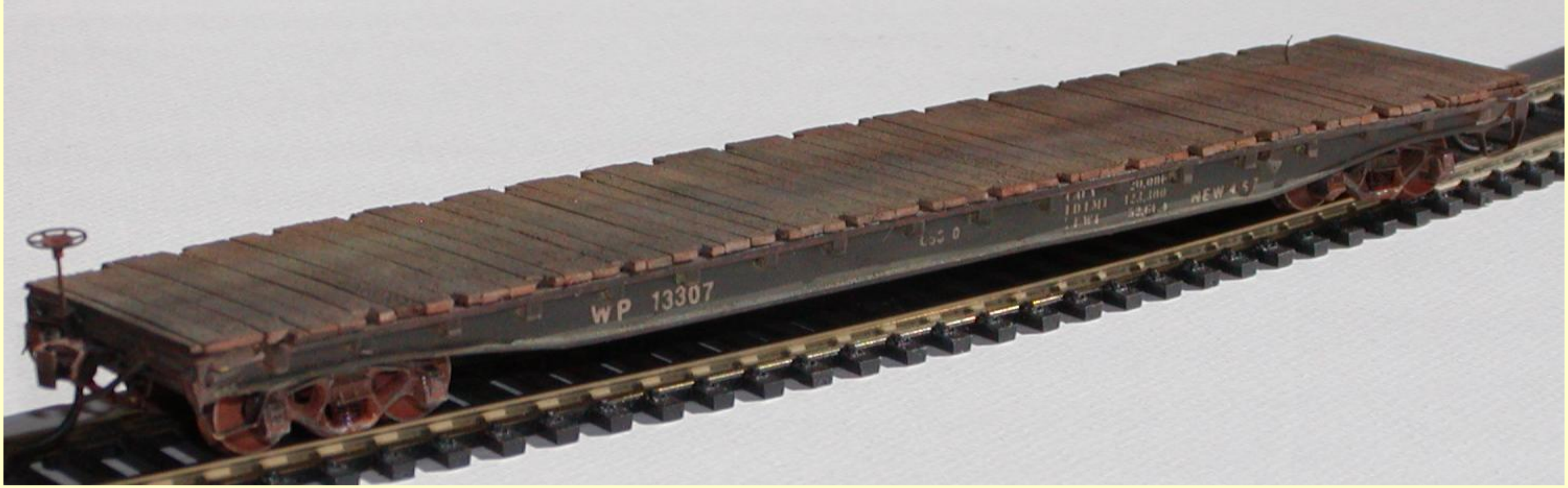
Scratch Built Flatcar

Session 4



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For this section we will talk in scale inches and feet.

Here is a conversion chart. Find the scale inch you want and read across to your scale and you will find the actual fraction of an inch that corresponds. Then use the closest available size of the desired material.

Ratio	220	160	87.1	64	48	22.5
Scale Inches	**Z**	**N**	**HO**	**S**	**O**	**G**
0.5	0.002	0.003	0.006	0.008	0.010	0.022
1	0.005	0.006	0.011	0.016	0.021	0.044
2	0.009	0.013	0.023	0.031	0.042	0.089
3	0.014	0.019	0.034	0.047	0.063	0.133
4	0.018	0.025	0.046	0.063	0.083	0.178
5	0.023	0.031	0.057	0.078	0.104	0.222
6	0.027	0.038	0.069	0.094	0.125	0.267
7	0.032	0.044	0.080	0.109	0.146	0.311
8	0.036	0.050	0.092	0.125	0.167	0.356
9	0.041	0.056	0.103	0.141	0.188	0.400
10	0.045	0.063	0.115	0.156	0.208	0.444
11	0.050	0.069	0.126	0.172	0.229	0.489
12	0.055	0.075	0.138	0.188	0.250	0.533

For example, let's say we wanted to approximate the 2x12 decking planks in N scale. Then if a true "scale" version is not available we'd look for something as close to .013x.075 as we could find.

Scratch Built Flatcar

Here is a conversion chart in “feet”

Ratio	220	160	87.1	64	48	22.5
Scale feet	**Z**	**N**	**HO**	**S**	**O**	**G**
1	0.055	0.075	0.138	0.188	0.250	0.533
2	0.109	0.150	0.276	0.375	0.500	1.067
3	0.164	0.225	0.413	0.563	0.750	1.600
4	0.218	0.300	0.551	0.750	1.000	2.133
5	0.273	0.375	0.689	0.938	1.250	2.667
6	0.327	0.450	0.827	1.125	1.500	3.200
7	0.382	0.525	0.964	1.313	1.750	3.733
8	0.436	0.600	1.102	1.500	2.000	4.267
9	0.491	0.675	1.240	1.688	2.250	4.800
10	0.545	0.750	1.378	1.875	2.500	5.333
11	0.600	0.825	1.515	2.063	2.750	5.867
12	0.655	0.900	1.653	2.250	3.000	6.400
13	0.709	0.975	1.791	2.438	3.250	6.933
14	0.764	1.050	1.929	2.625	3.500	7.467
15	0.818	1.125	2.067	2.813	3.750	8.000
16	0.873	1.200	2.204	3.000	4.000	8.533
17	0.927	1.275	2.342	3.188	4.250	9.067
18	0.982	1.350	2.480	3.375	4.500	9.600
19	1.036	1.425	2.618	3.563	4.750	10.133
20	1.091	1.500	2.755	3.750	5.000	10.667
21	1.145	1.575	2.893	3.938	5.250	11.200
22	1.200	1.650	3.031	4.125	5.500	11.733
23	1.255	1.725	3.169	4.313	5.750	12.267
24	1.309	1.800	3.307	4.500	6.000	12.800
25	1.364	1.875	3.444	4.688	6.250	13.333

So, let’s say we needed to cut those planks 10.5 feet long. Again in N scale, 10' = 0.750” and from the previous chart 6” = 0.038. Therefore we’d cut the planks 0.750+0.038 = 0.788 inches long.

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It’s time to add grab irons

There’s 2 ways of doing this,

first you can purchase pre-formed grabs of the appropriate size.

But where’s the fun in that?

So we’ll do it the second way “scratch” build them.

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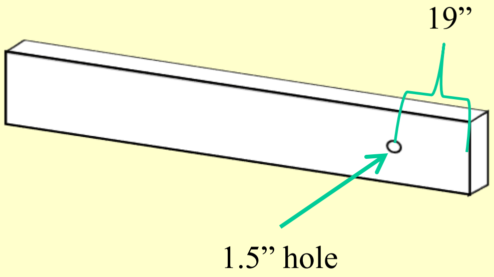
It's time to add grab irons

To make this a bit easier we'll first make a jig. Start with a sturdy piece of scrap styrene say 060x250 or so and long enough to handle easily.



Measure in from the end 19" and drill a hole the same size as your 1.5" brass wire.

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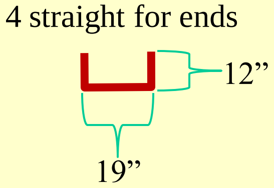
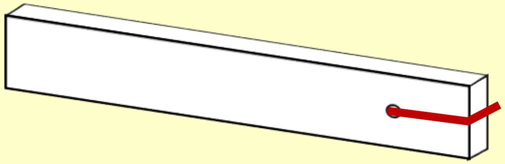
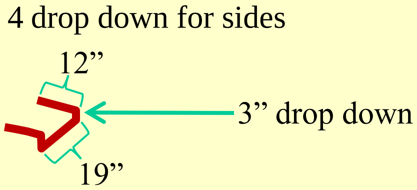
It’s time to add grab irons

Using the jig insert one end of the 1.5” brass wire in the hole approximately 12-15” deep then bend the wire towards the end of the jig and again bend the wire over the edge forming a square “U”. Cut the wire leaving approximately 12-15”.







You will need 4 straight grab irons for the ends and 4 “drop down” grabs for the sides. Use a small pair of needle nose pliers to make the 3” drop down

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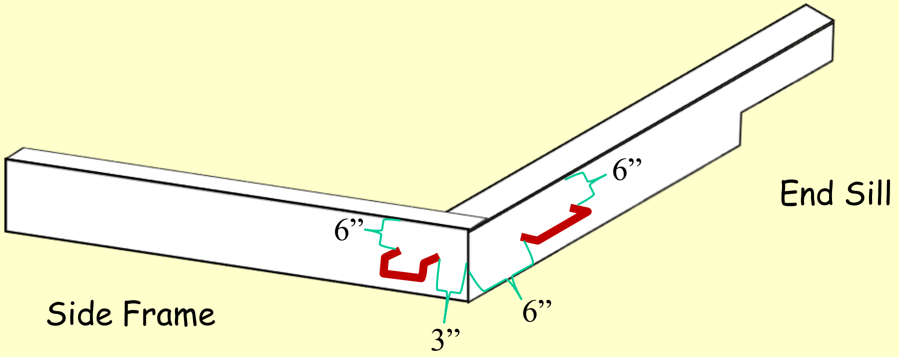
It's time to add grab irons

Now, pre-drill 1.5" holes in the end sills and the sides and ACC the grabs in place. See below for placement.



Repeat this on all four corners

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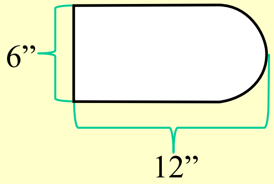
Next we'll add the manual brake housing, support, brake shaft, and brake wheel

If your brake set came with a Ratchet Assembly you can use that here but we'll describe how to make one in case it didn't.



Start with a piece of 2"x6" styrene and cut it 12" long then round one end to form the bottom support.

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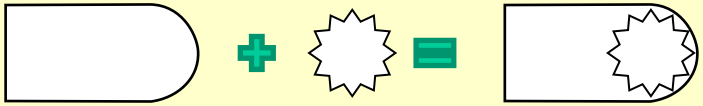
Next we’ll add the manual brake housing, support, brake shaft, and brake wheel

To make the ratchet itself we’ll start with a 2”x6” piece of styrene and cut it 6” long. Then clip off the corners to make it an octagon and file it round. You’re not quite done yet, however. Now file small teeth to form the ratchet.



Then glue it to the bottom support centered on the rounded end.

You might consider skipping the teeth filing step for the smaller scales.

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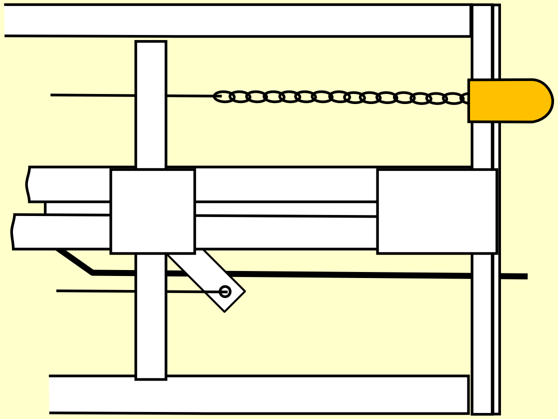
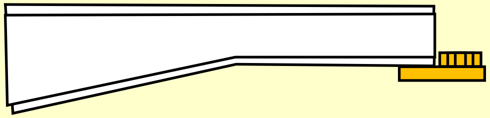
Next we'll add the manual brake housing, support, brake shaft, and brake wheel



Bottom View



Side View

Now glue this assembly under the end sill right where the brake chain was attached in the previous session. The "ratchet" should be facing up.

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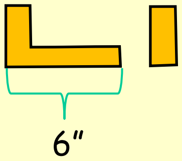
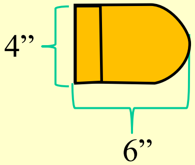
Next we'll add the manual brake housing, support, brake shaft, and brake wheel





The upper bracket is made by taking a 4" section of your channel material and cutting off one side to form an "L" that is 4" wide and 6" long. Then round the outer edge to match the lower bracket.

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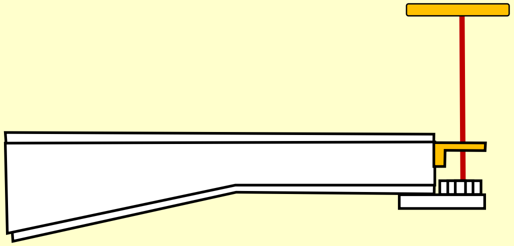
Next we'll add the manual brake housing, support, brake shaft, and brake wheel



Side View

Now glue the upper bracket in place right above the lower bracket. When the glue has dried drill a 1.5" hole through the upper bracket and into the "ratchet" on the lower bracket. Then cut a piece of 1.5" brass wire approximately 4 feet long and glue it in place with ACC. Finally drill a pilot hole in a brake wheel and add it to the top of the shaft.

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Now it's time to add the stirrups under each corner on the sides.

These are made from very thin sheet brass cut into 2.5" wide strips. For HO scale we used the thinnest we could find which was .005". This size could be used for most scale except for G or possibly O where you might want to use slightly thicker material. You will need 4 lengths that are 2.5" wide by 52" long.

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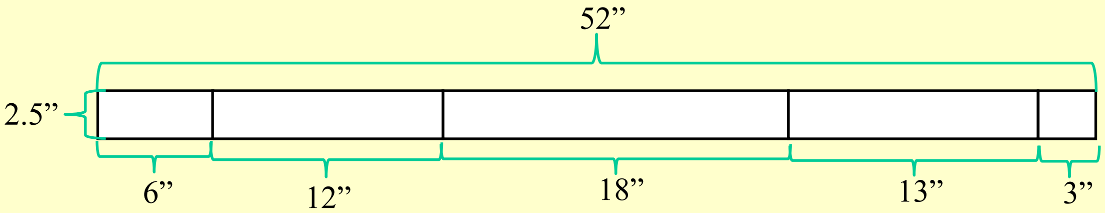
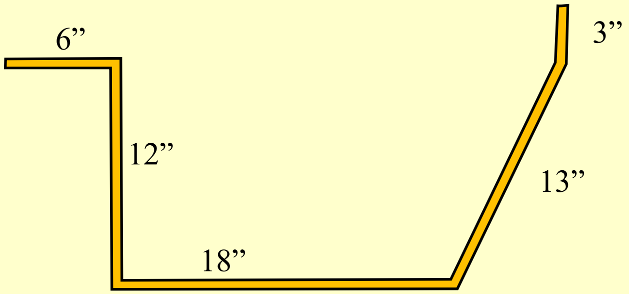
Now it's time to add the stirrups under each corner on the sides.

Now mark off each strip as shown here





Then bend the strip as shown here

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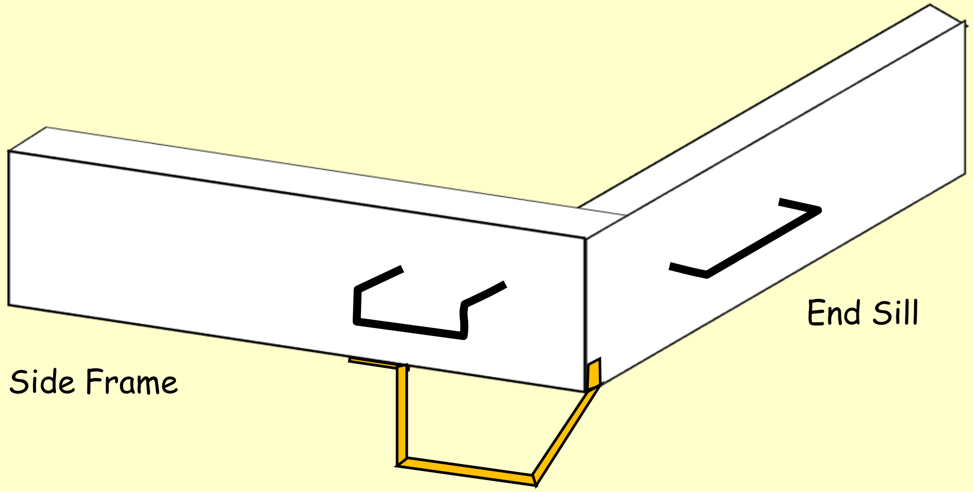
Now it's time to add the stirrups under each corner on the sides.

Attach the stirrups using ACC



Repeat this on all four corners

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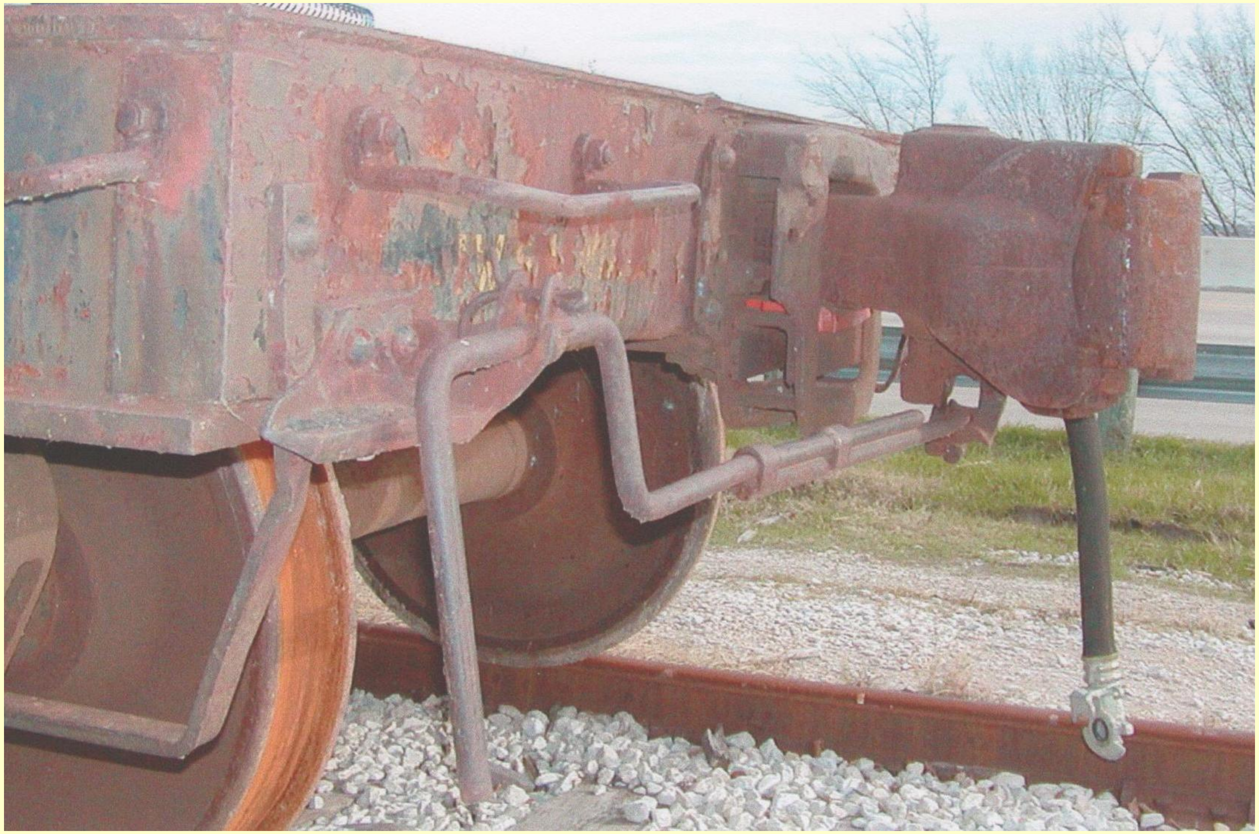
Now comes the coupler locking pin arms

These are on the left side of each end as you're facing the end of the car.

Here's a picture of the prototype so you know what we're trying to accomplish.



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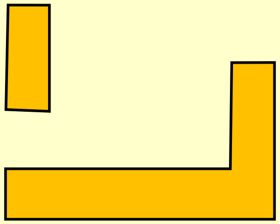
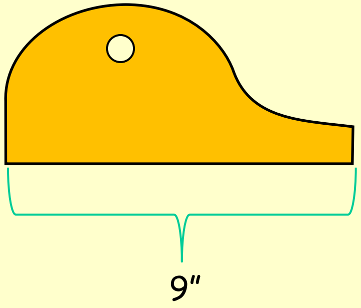
Now comes the coupler locking pin arms

To make the bracket that holds the arms we'll start with a piece of channel that is close to 2' (for HO we used $\frac{1}{4}$" channel) and cut a 9" length. Like we've done before, trim off one end to form an "L".





Now trim the remaining end to match the above shape and drill a hole to accept a 1.5" pin. Don't forget to make 2 of these.

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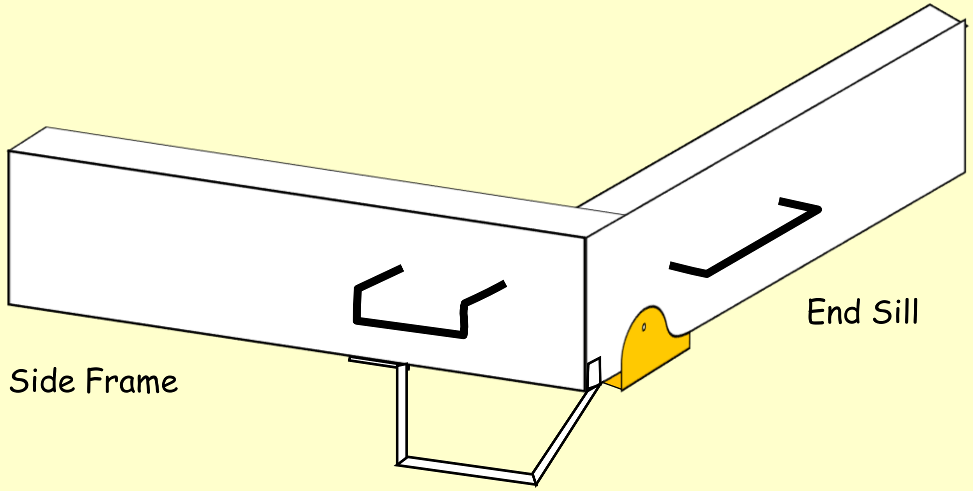
Now comes the coupler locking pin arms

Now glue these in place as indicated below.



Repeat for other end

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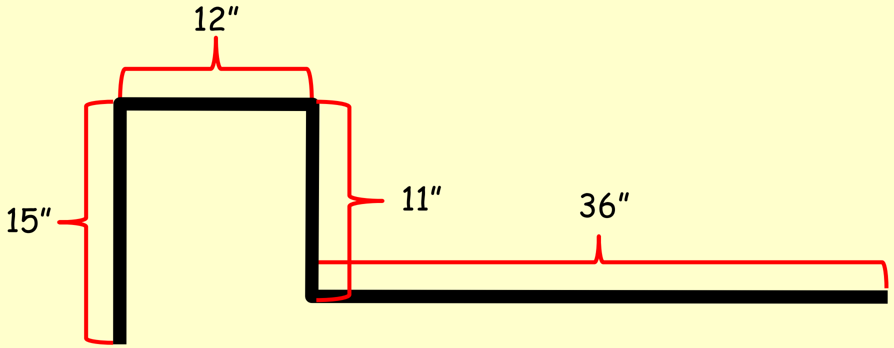
Use 1.5" brass rod to make the coupler pin



Bend and cut 2 pieces as shown above

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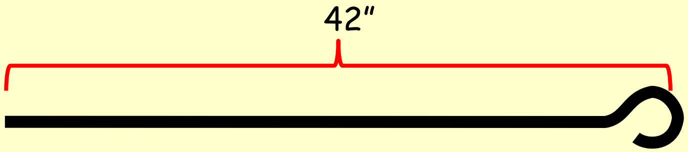
Use 1.5" brass rod to make the coupler pin



Bend and cut 2 pieces as shown above

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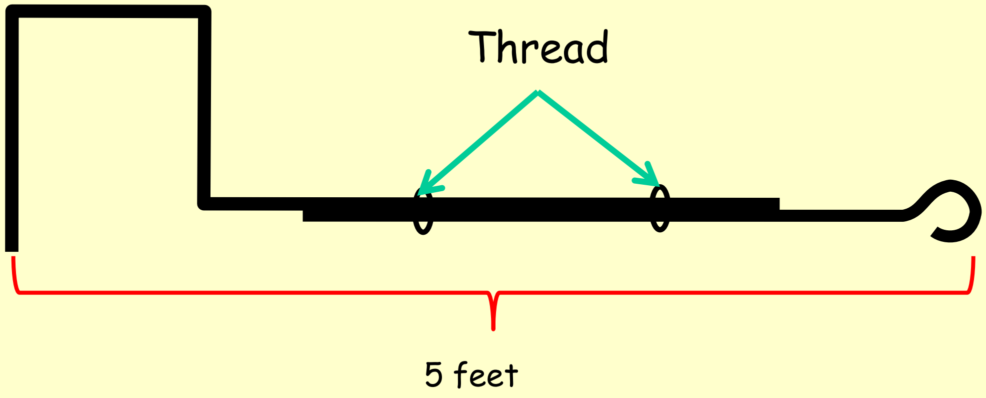
Now join these 2 pieces as indicated and tie them together with a small piece of thread



Once you've tied these together hit the thread areas with a little ACC and trim off the loose ends when dry. Don't forget to make 2 of these

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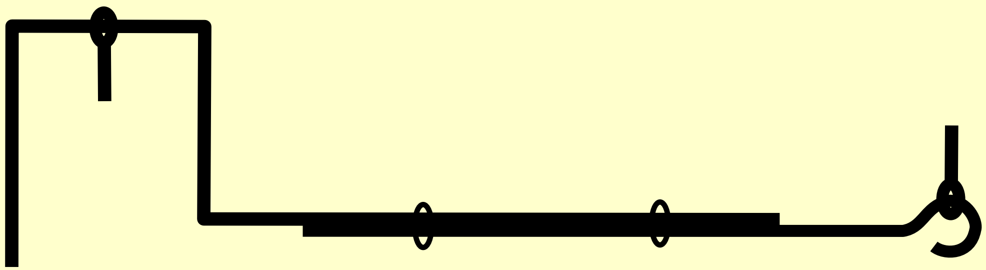
While you are at it, make 4 small eye-bolts out of the same 1.5” wire and slide them on the coupler pin as indicated below.



We’ll install this assembly after the couplers have been installed.

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It's time to add the decking

Dig out all those decking planks we cut and stained a while back and mix them all up.

Since we're gluing wood to styrene we'll need to use a gel or gap filling ACC or a contact cement. I recommend ACC so you have a little time to work with each plank before it sets up completely. You will have to cut some of the planks to account for the stake pockets.

It's your choice if you want to start at one end and work across the car or start in the center and work towards both ends. I prefer starting in the center so I can line up with the stake pockets and if things don't quite fit I'll trim the last board on each end to fit.

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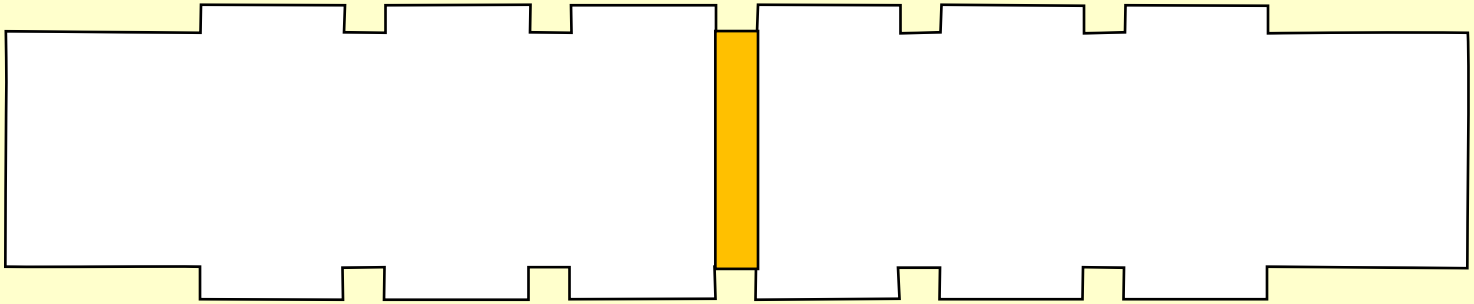
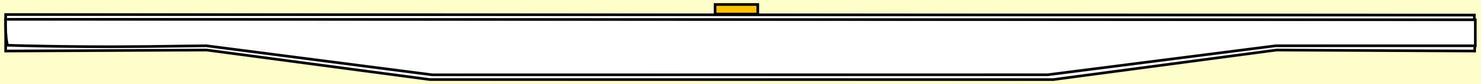
It's time to add the decking

Cut a starter plank the distance between the stake pockets in the center of the car.



Then run a small bead of gel ACC down the plank and put it in place. Let this one dry completely before beginning. If you don't it might shift while you are adding other planks and cause you to get off square.



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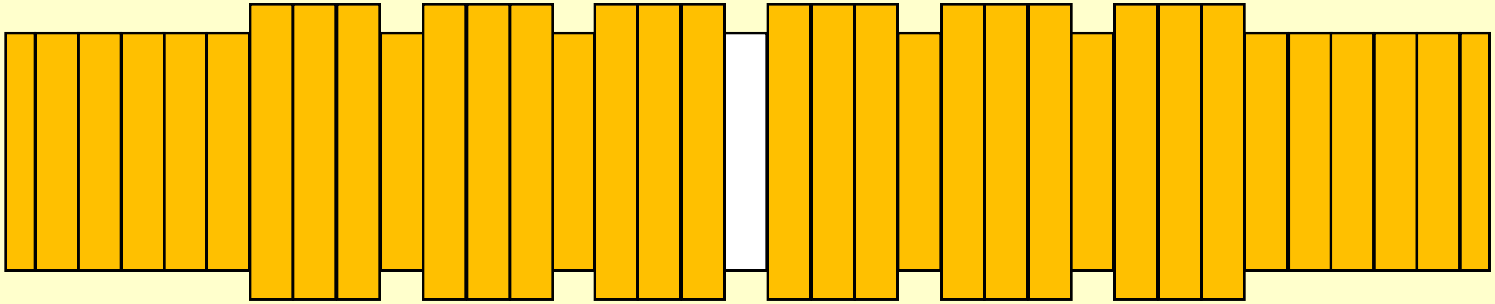
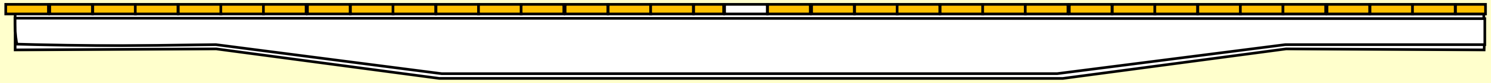
It's time to add the decking

Once your starter plank is full set you can start cutting and adding planks on either side of it until you reach the end. You may have to trim the width of the end planks to fit.

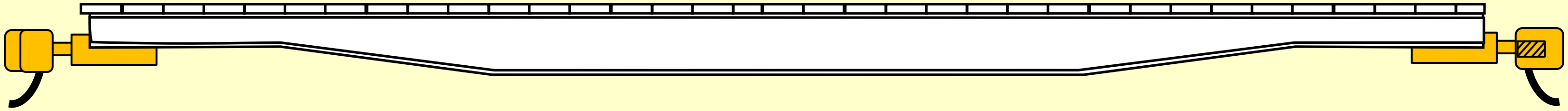


In addition to the various stains that you applied you can take a knife and break a plank or two and even gouge out some spots to further weather the decking.



Next add on the couplers

These should fit right into the opening you made for them when you first built the frame. If not, then trim as necessary. These should be free to swing in the coupler pockets and should automatically center when released.



We'll adjust height to meet NMRA standards after we install the trucks.

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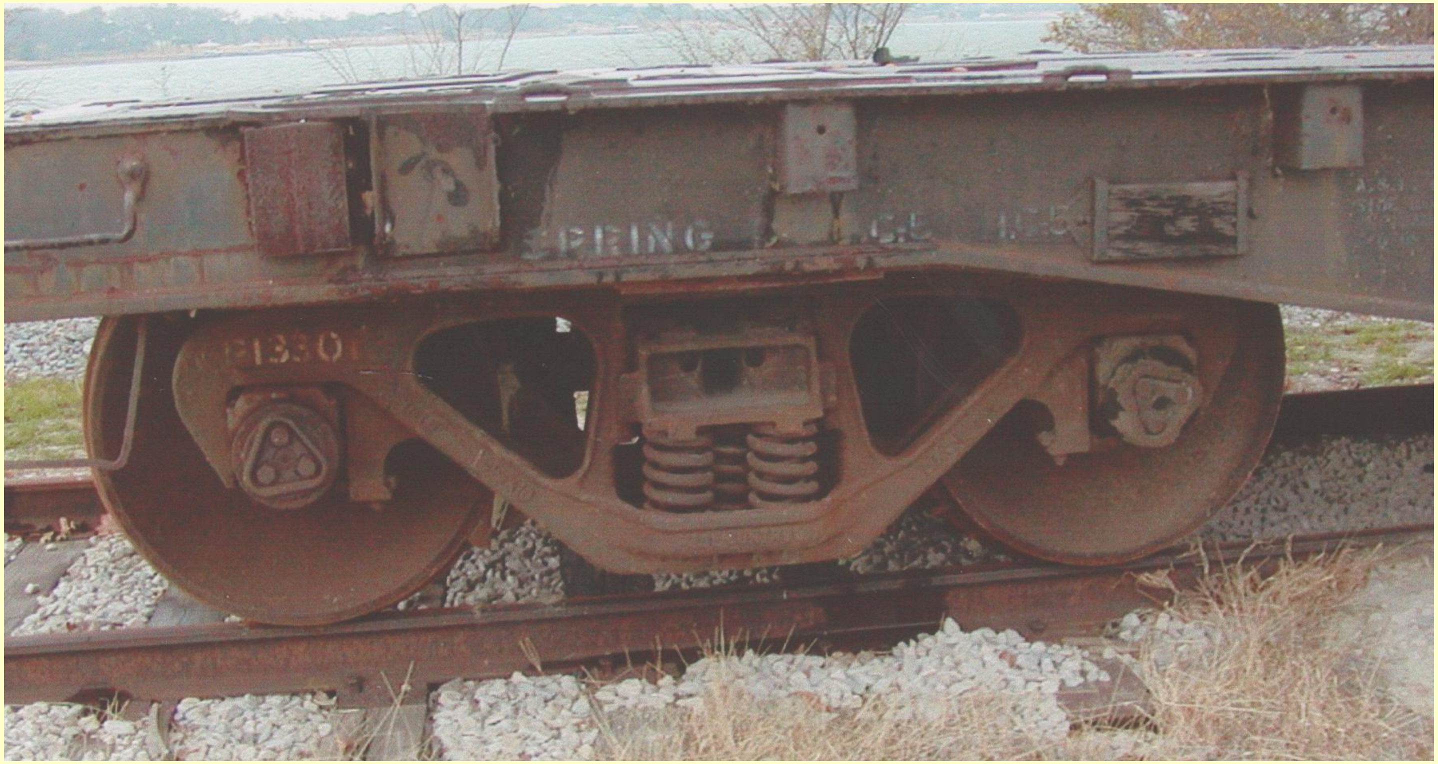
Then add the Trucks

Here is a photo of the prototype so you can match the type of trucks.



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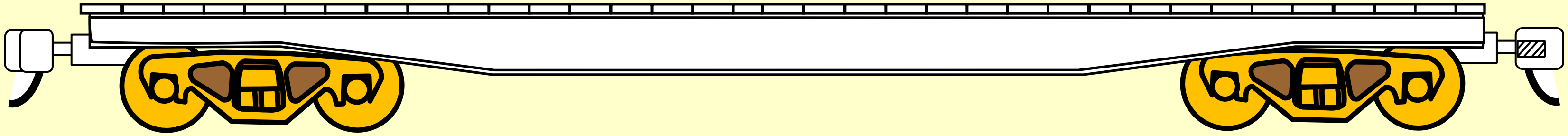
Then add the Trucks

Make sure the trucks are free to swivel and that they have a reasonable amount of turn before hitting any of the frame



Now adjust the coupler height to meet NMRA standards.

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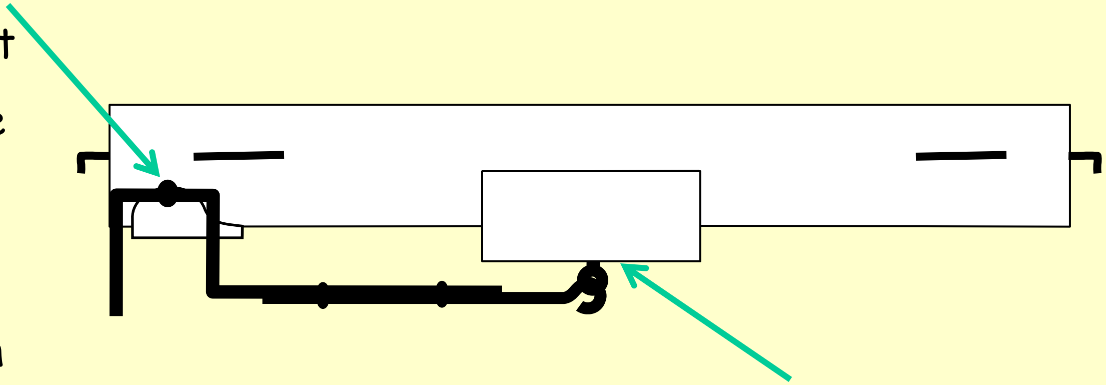
One last construction step

Now that the couplers are installed and adjusted we can add the coupler pin we made earlier.



Glue the upper eyebolt into the hole on the coupler pin support with ACC

Drill a 1/5" hole in the bottom of the coupler pocket and insert the other eyebolt. Technically this would go on the bottom of the coupler knuckle but then it wouldn't swivel.

Scratch Built Flatcar

That's it for this project and you've just totally scratch built a car!

Congratulations!

All that's left for you to do is paint your model your desired color, decal it, and weather it with an air-brush, chalks or your favorite method.

Please bring your model to the January meeting even if it isn't finished.